

nonelectrolytes, such as boron and organic compounds such as isopropyl alcohol. The membranes of the invention are formed by interfacial polymerization followed by bromination using chlorine and a bromide compound (e.g., sodium bromide). Claim 1 includes the limitation, "the polyamide skin layer contains bromide introduced into the polyamide skin layer by treating the polyamide skin layer with a free chlorine aqueous solution containing a bromine compound, the bromide being introduced subsequent to forming the polyamide skin layer."

The Examiner rejected claims 1 and 2 as being anticipated by U.S. Patent No. 4,960,518 issued to Cadotte *et al.* ("the Cadotte patent"). This rejection is respectfully traversed.

The Cadotte patent relates to *oxidation*, not bromination, of preformed polyamide membranes. The oxidizing agents used include "percarboxylic acid, periodic acid, N-chloroamine compounds and N-bromoamine. The reagent is preferably selected from the group consisting of peracetic acid, periodic acid, or chloramine." (Col. 5, lines 13-17). "The oxidizing reagents employed herein are believed to oxidize pendant amine groups remaining in the desalinizing layer to convert such groups to groups which are less basic." (Col. 5, lines 32-35). Because the Cadotte patent does not disclose *bromination* using "chlorine and a bromine compound," as recited in claim 1, it cannot anticipate the claim 1. Claim 2 depends from claim 1 and, therefore, cannot be anticipated by the Cadotte patent for at least the same reasons. Therefore, withdrawal of the § 102 rejection of claims 1 and 2 is respectfully requested.

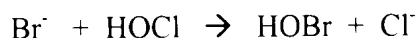
III. Rejections under 35 U.S.C. § 103

The Examiner rejected claims 3-5 under 35 U.S.C. § 103(a) as being unpatentable over the Cadotte patent. This rejection is respectfully traversed.

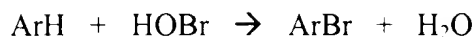
The Cadotte patent does not teach or suggest the present invention. As shown in Table IV, example 9, which relates to a membrane treated with chloramine, has a lower isopropyl alcohol (IPA) rejection rate (i.e., higher passage rate) than the control membrane without the treatment. (Table IV, Col. 11-12). In general, an *oxidation* reaction according to the Cadotte patent reduces the water flux and solute passage "with the exception of the membranes treated with periodic acid and *chloramine*, which show increased solute passage for isopropyl alcohol." (Col. 11, lines 13-17) (emphasis added). Similarly, examples 12 and 13 show that treatment with 1000 parts per million *chloramine* in water for 20 hours resulted in moderately higher solute passage rates. (Col. 12, lines 32-41; see also, Table V, examples 12 and 13). Thus, the Cadotte patent teaches that chloramine treatment (i.e., *oxidation*) results in an increased solute (e.g., IPA) passages, as opposed to a decreased solute passage by *bromination* as disclosed in the present invention. Thus, the Cadotte patent teaches away from the present invention and cannot render the present invention, as recited in claim 1, obvious. Claims 3-5 depend directly from claim 1 and, therefore, are not obvious over the Cadotte patent. Therefore, withdrawal of the §103(a) rejection of claims 3-5 is respectfully requested.

IV. Other comments

While the present invention is not limited by any specific mechanism, the Applicant believes that in the examples of the present invention, when free chlorine and NaBr are dissolved in water, the following reaction between Br^- and HOCl , which is formed between chlorine and water, occurs:



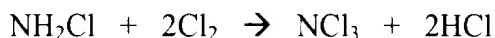
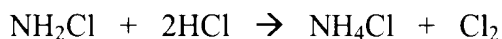
HOBr thus generated then reacts with aromatic rings of polyamide skin layers in an electrophilic reaction as follows:



On the other hand, as stated in the Office action, chloramine (NH_2Cl) decomposes in water to produce nitrogen, hydrochloric acid, and ammonium chloride, according to the following reaction:



The chloride ion (Cl^-) in hydrochloric acid (HCl) is at the most reduced state (-1) possible for the chlorine atom. Note that an oxidation agent is itself reduced in a redox reaction. Therefore, hydrochloric acid cannot be an oxidation agent. Instead, the Applicant believes HCl thus generated catalyzes further decomposition of chloramine as follows:



Thus, NH_2Cl is eventually decomposed into NH_4Cl and NCl_3 . Similarly, bromamine is eventually decomposed into NH_4Br and NBr_3 . The Applicant believes that while bromamine or some of its decomposition products may have some oxidizing potential, none of these are believed to be good brominating agents or to exist at high enough concentrations to function as bromination agents.

Accordingly, the Applicant respectfully disagrees with the Examiner's assertion that the composition in terms of (Br/N) as claimed in claims 3 and 7 can be achieved by adding from 0.01 to 10% of the oxidizing agent or bromide containing compound, e.g., N-bromoamine, to the

aqueous solution for post-treating the composite polyamide membrane as disclosed by the Cadotte patent. Therefore, rejection of claim 3 is improper on this additional ground.

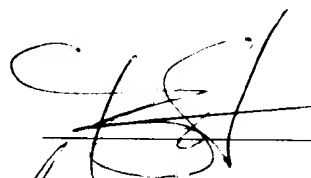
V. Conclusion

Claims 1-5 have been shown to be allowable over the prior art. Applicant believes that this paper is responsive to each and every ground of rejection cited by the Examiner in the Action dated July 2, 2002, and respectfully requests favorable action in the form of a Notice of Allowance.

Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference No. 04558.044001).

Respectfully submitted,

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